

Name: _____

Date: _____

A2CC Properties of Exponents

Properties of Exponents

An exponent (also called power or degree) tells us how many times the base will be multiplied by itself. For example x^5 , the exponent is 5 and the base is x . This means that the variable x will be multiplied by itself 5 times. You can also think of this as x to the fifth power.

Below is a list of properties of exponents:

| Properties | General Form | Application | Example |
|---|--------------------|-----------------|--|
| Product Rule <i>Same base add exponents</i> | $a^m a^n$ | a^{m+n} | $x^5 x^3 = x^{5+3} = x^8$ |
| Quotient Rule <i>Same base subtract exponents</i> | $\frac{a^m}{a^n}$ | a^{m-n} | $\frac{x^9}{x^5} = x^{9-5} = x^4$ |
| Power Rule I <i>Power raised to a power multiply exponents.</i> | $(a^m)^n$ | a^{mn} | $(x^3)^4 = x^{3 \cdot 4} = x^{12}$ |
| Power Rule II <i>Product to power distribute to each base</i> | $(ab)^m$ | $a^m a^n$ | $(4x^3)^2 = 4^2 x^{3 \cdot 2} = 16x^6$ |
| Negative Exponent I <i>Flip and change sign to positive</i> | a^{-m} | $\frac{1}{a^m}$ | $x^{-3} = \frac{1}{x^3}$ |
| Negative Exponent II <i>Flip and change sign to positive</i> | $\frac{1}{a^{-m}}$ | a^m | $\frac{1}{x^{-5}} = x^5$ |
| Zero Exponent <i>Anything to the zero power (except 0) is one</i> | a^0 | $a^0 = 1$ | $(-4x)^0 = 1$ |

EXPONENTS PRACTICE

Simplify:

1. $3 \cdot 4^3$

2. $4x^3 \cdot 2x^3$

3. $x^5 \cdot x^3$

4. $2x^3 \cdot 2x^2$

5. $\frac{6^5}{6^3}$

6. $\frac{x^4}{x^7}$

7. 8^0

8. $-(9x)^0$

9. $(y^4)^3$

10. $(x^2y)^4$

11. $\frac{6x^7}{2x^4}$

12. $\frac{8x^5}{4x^2}$

13. $(2cd^4)^2(cd)^5$

14. $(2fg^4)^4(fg)^6$

15. $\frac{x^5y^6}{xy^2}$

16. $\frac{x^2y^5}{xy^4}$

17. $\left(\frac{4x^5y}{16xy^4}\right)^3$

18. $\left(\frac{5x^3y}{20xy^5}\right)^4$

19. y^{-7}

20. 7^{-2}

21. $\frac{1}{x^{-5}}$

22. $\frac{1}{2^{-4}}$

23. $x^5 \cdot x^{-1}$

24. x^{-6}

25. $x^9 \cdot x^{-7}$

26. $(j^{-13})(j^4)(j^6)$

27. $\frac{x^{-1}}{x^{-8}}$

28. $\frac{52x^6}{13x^{-7}}$

29. $f^{-3}(f^2)(f^{-3})$

30. $\frac{x^{-4}}{x^{-9}}$

31. $\frac{24x^6}{12x^{-8}}$

32. $\frac{3x^2y^{-3}}{12x^6y^3}$

33. $(2x^3y^{-3})^{-2}$

34. $\frac{2x^4y^{-4}}{8x^7y^3}$

35. $(4x^4y^{-4})^3$

36. $5x^2y(2x^4y^{-3})$

37. $\left(\frac{-7a^2b^3c^0}{3a^3b^4c^3}\right)^{-4}$

38. $\left(\frac{-2a^3b^2c^0}{3a^2b^3c^7}\right)^{-2}$